(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 365 502 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89850344.6**

(51) Int. Cl.5: **C09D 17/00 , D21H 19/40**

(22) Date of filing: **11.10.89**

(30) Priority: **20.10.88 FI 884843**

(43) Date of publication of application:
25.04.90 Bulletin 90/17

(84) Designated Contracting States:
AT CH DE FR GB IT LI NL SE

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(54) Method for producing a pigment mix for coating paper.

(57) The invention concerns a method for preparing a pigment mix to be used in the coating of a paper web, in which method a water slurry is prepared containing talc and at least one other component of the coating mix such as calcined clay or calcined talc. The invention is characterized by first dispersing talc into a water slurry and thereafter mixing the second component of the coating mix in dry form into the talc slurry prepared in the first stage. This kind of a direct mixing method results in a pigment mix allowing preselected opacity and printability values of the paper to be attained using an appreciably lower proportion of the second component, such as calcined clay or calcined talc, in the mix.

EP 0 365 502 A2

METHOD FOR PRODUCING A PIGMENT MIX FOR COATING PAPER

The present invention concerns a method for producing a pigment mix to be used in paper web coating, in which method a water slurry containing talc and at least one additional component is prepared.

Coating of base paper with a coating mix containing only fine-dispersed talc pigment results in very good paper quality parameters in coated papers, particularly for the printability of the paper.

Since a continuing trend of decrease in the basis weights of coated papers has recently been accentuated; together with the corresponding decrease in the application weights (g/m^2) of coating mixes, a critical paper characteristic in offset and rotogravure printable papers has turned out to be the opacity of paper. In addition, reduced coat weights generate printability problems in paper grades used in rotogravure printing, since a sufficient coat smoothness is difficult to attain at a level required in this printing method. The above described opacity and printability problems become generally evident at coat weights below 7 g/m^2. When using talc as the coating pigment, the above described problems are further accentuated at low coat weights, because the structure of the coating tends to become excessively compact due to the predominantly platelet-shaped form of the talc particle.

Conventional methods using talc-based coating for the improvement of opacity at low coat weights are based on the use of different kinds of auxiliary pigments. The most common auxiliary pigment is calcined clay. In conjunction with talc, calcined clay renders good quality characteristics to the paper, improving both opacity and printability by 100% in comparison with a simple talc coating. In the prior art method the calcined clay is dispersed into a water slurry with max. 50...52 % solids, after which the calcined clay slurry is mixed with a talc slurry of 65...67 % solids. When manufacturing the pigment mix in this method, the minimum proportion of calcined clay needed in order to attain a noticeable improvement in the above mentioned paper quality parameters is approx. 10 % of the total pigment solids. Due to the high price of calcined clay the tendency has been to minimize the proportion of clay in the pigment mix formula.

The present invention aims to achieve a novel method for producing a pigment mix containing talc, whereby the quantity of the component in the mix, such as calcined clay or the like, can be essentially reduced from conventionally applied levels without subsequently lowering the quality parameters of the coated paper obtained by this method. The invention is characterized by first dispersing talc into the water and thereafter dispersing the second component of the mix in dry form directly into the talc slurry obtained in the first stage.

A coating mix made into a mixtured slurry containing talc and calcined clay using the method according to the invention features an appreciably higher efficiency of the calcined clay as an unsealant of the compact talc coating in comparison with its function in a pigment mix of separately produced slurries that is prepared by a separate slurrying of the calcined clay and talc prior to their later mixing. Comparison of the quality charac teristics, opacity and printability of a light-weight paper coated with a coating mix prepared in the direct mixing method on one hand, and with a coating mix prepared from separately dispersed slurries on the other, the pigment mix prepared by the direct mixing method is found to improve the above mentioned paper quality parameters significantly in comparison with those obtained using a coating mix prepared from separately pre-made slurries. The degree of improvement will be evidenced by the exemplifying cases to be described later.

Instead of calcined clay, the use of other pigments, particularly calcined talc, for the preparation of the mix is conceivable within the scope of the invention. The exemplifying cases to be described later indicate that the direct mixing method according to the invention improves the paper properties both in papers coated with coating mixes of conventional formulas containing uncalcined and calcined talc as well as in papers coated with coating mixes containing talc and calcined clay.

In accordance with the invention, a coating mix containing talc and a second component, such as calcined clay, can be prepared using the direct mixing method so that calcined clay powder is mixed into the ready-dispersed talc pigment slurry (with 65...67 % solids), and when required, water is added for the control of final solids content. The proportion of calcined clay is 2...20 %, preferably 5...10 %, of the total solids. The final solids in the slurry prepared in this method is 50...70 %, preferably 55...65 %.

With the help of exemplifying cases based on test data, the invention is clarified in the following by comparing the results obtained for coating mixes produced by the direct mixing method according to the invention with the results obtained for conventionally prepared coating mixes.

Case 1

Coating mixes were made from both a slurry prepared in the method according to the invention to contain talc and calcined clay as well as from a slurry prepared in the conventional method; in the preparation the slurries were complemented with the required adhesive (5 parts of alkali-expandable acrylic latex), while the solids of the slurries was adjusted to 50 % by adding water. The coating mix was applied on the base paper in a laboratory coating machine using a web speed of 400 m/min. The paper sheet was calendered in a laboratory calender (having five nips) using a linear calendering force of 230 kN/m at 25 °C temperature and 5 % humidity of paper web. The paper quality parameters of the paper sheet samples coated with different coat weights were computed by interpolation to correspond to coat weights 5.5 and 6.5 g/m^2.

Printability evaluations were performed using the conventional Heliotest method in which the IGT apparatus is used for printing a trace of 110 mm length, and starting from the beginning of the trace, the distance (in mm) is measured up to the point cumulatively containing 20 missing dots. In simple words, the higher the Heliotest reading, the better the paper printability. A difference level of significance in Heliotest readings can be esteemed to start at 5 mm difference in the compared values. The paper opacity was determined using the Elrepho apparatus, in which the difference level of significance is at about 0.5 % units.

The results are shown in the following tables.

Table 1

Effect of final solids content of talc- and calcined clay-containing coating mix obtained with the direct mixing method on the opacity and printability of coated paper.

Test point	1	2	3	4	5	6
DIRECT MIXING METHOD						
Finntalc C10	95	95	90	90	85	85
Calcined clay	5	5	10	10	15	15
Final solids of coating mix (%)	67	55	67	55	67	55
COAT WEIGHT 5.5 g/m^2						
Opacity (%)	85.3	85.0	85.8	85.8	85.6	86.1
Heliotest (mm)	84	87	91	90	82	103
COAT WEIGHT 6.5 g/m^2						
Opacity (%)	86.0	85.7	86.4	86.4	86.0	86.7
Heliotest (mm)	90	92	95	97	92	109

From the results it can be seen that 5 or 10 parts of calcined clay in the coating mix solids has only a marginal effect on the paper quality parameters, while 15 parts of calcined clay in the coating mix solids has a significant effect on the paper qualities in such a manner that an increase in solids to 67 % brings a significant deterioration in the quality values.

Table 2

Comparison of opacity and printability values of paper coated with a mix prepared either as a directly mixed talc-and calcined clay-containing coating mix or as a separately slurried mix.						
Test point	1	2	3	4	5	6
DIRECT MIXING METHOD						
Finntalc C10	95	90	85			
Calcined clay	5	10	15			
Final solids of coating mix (%)	67	67	55			
SEPARATE SLURRYING METHOD						
Finntalc C10 - solids: 65.5 %				95	90	85
Calcined clay - solids: 50 %				5	10	15
Final solids of coating mix (%)				64.7	63.5	62.6
COAT WEIGHT 5.5 g/m^2						
Opacity (%)	85.3	85.8	86.1	84.8	85.2	85.8
Heliotest (mm)	84	91	103	77	86	86
COAT WEIGHT 6.5 g/m^2						
Opacity (%)	86.0	86.4	86.7	85.3	85.7	86.4
Heliotest (mm)	90	94	109	85	91	92

When using the results of the separately slurried mix, in which the proportion of calcined clay is 15 parts, as the reference quality level of coated paper, the above results show that equal paper quality level is achieved by directly mixed coating mixes when using 10 parts of calcined clay, while a mix containing 5 parts of calcined clay results. in an almost equal quality level. In addition, the direct mixing method makes it possible to use a higher solids content of the coating mix when the proportion of calcined clay is below 15 parts.

Case 2

Coating mixes were made from both a slurry prepared in the method according to the invention to contain talc and calcined clay as well as from a slurry prepared in the conventional method; in the preparation the slurries were complemented with the required adhesive (6 parts of alkali-expandable acrylic latex), while the solids of the slurries was adjusted to 50 % by adding water. The coating mix was applied on the base paper in laboratory coating machine using a web speed of 400 m/min. The paper sheet was calendered in a laboratory calender (having five nips) using a linear calendering force of 230 kN/m at 25 °C temperature and 5 % humidity of paper web. The paper quality parameters of the paper sheet samples coated with different coat weights were computed by interpolation to correspond to coat weights 5.5 and 6.5 g/m^2.

Table 3

Effect of final solids content of talc- and calcined talc-containing coating mix obtained with the direct mixing method on the opacity and printability of coated paper.						
Test point	1	2	3	4	5	6
DIRECT MIXING METHOD						
Finntalc C10 Calcined talc Final solids of coating mix (%)	95 5 65	95 5 55	90 10 65	90 10 55	85 15 65	85 15 55
COAT WEIGHT 5.5 g/m^2						
Opacity (%) Heliotest (mm)	85.5 85	86.6 88	85.8 84	86.2 87	86.4 78	86.9 90
COAT WEIGHT 6.5 g/m^2						
Opacity (%) Heliotest (mm)	86.2 86	86.7 90	86.6 87	87.1 92	87.0 85	87.1 98

From the results it can be seen that the use of calcined talc makes the solids content of coating mix to have a significant effect on the paper quality parameters therein that both the printability and opacity are deteriorated when the solids reach 65 %.

Table 4

Comparison of opacity and printability values of paper coated with either the directly mixed talc-and calcined talc-coating mix or a separately slurried mix.						
Test point	1	2	3	4	5	6
DIRECT MIXING METHOD						
Finntalc C10 Calcined talc Final solids of coating mix (%)	95 5 55	90 10 55	85 15 55			
SEPARATE SLURRYING						
Finntalc C10 - solids: 65.5 % Calcined clay - solids: 50 % Final solid of coating mix (%)				95 5 64.7	90 10 63.5	85 15 62.6
COAT WEIGHT 5.5 g/m^2						
Opacity (%) Heliotest (mm)	86.6 88	86.7 89	86.9 90	86.0 85	86.2 85	86.6 87
COAT WEIGHT 6.5 g/m^2						
Opacity (%) Heliotest (mm)	87.0 90	87.1 92	87.2 98	86.4 88	86.7 91	87.2 95

When using the results of the separately slurried mix, in which the proportion of calcined clay is 15 parts, as the reference quality level of coated paper, the above results show that equal paper quality level is achieved by directly mixed coating mixes when using only 5 parts of calcined talc. In the direct mixing

method the use of calcined talc makes it impossible to use a higher solids content.

For those versed in the art it is evident that the embodiments of the invention are not exhausted by the examples described above, but instead, can vary within the scope of the claims.

Claims

1. A method for preparing a pigment mix for coating a paper web, in which method a slurry containing talc and least one other component of the mix is prepared, **characterized** in that talc is first dispersed in the water and that the second component of the coating mix is then directly mixed in dry form into the talc slurry thus obtained.

2. A method as claimed in claim 1, **characterized** in that the second component of the coating mix is calcined clay.

3. A method as claimed in claim 1, **characterized** in that the first component to be dispersed is conventional talc while the second component to be dispersed is calcined talc.

4. A method as claimed in any of the foregoing claims, **characterized** in that the solids content of the talc slurry formed in the first stage is 65...67 %.

5. A method as claimed in claim 2 or 4, **characterized** in that the calcined clay in powder form is dispersed into the talc slurry so as to make the proportion of the clay to be 2...20 %, preferably 5...10 %, of the total pigment solids.

6. A method as claimed in any of the foregoing claims, **characterized** in that water is added in conjunction with the dispersion of the second component of the coating mix in order to adjust the total solids content of the mix.

7. A method as claimed in any of claims 4...6, **characterized** in that water is added so as to make the total solids of the mix to be 50...70 %, preferably 55...65 %.

PUB-NO: EP000365502A2

DOCUMENT-IDENTIFIER: EP 365502 A2

TITLE: Method for producing a pigment mix for coating paper.

PUBN-DATE: April 25, 1990

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APPL-NO: EP89850344

APPL-DATE: October 11, 1989

PRIORITY-DATA: FI00884843A (October 20, 1988)

INT-CL (IPC): C09D017/00 , D21H019/40

EUR-CL (EPC): D21H019/40

US-CL-CURRENT: 524/445

ABSTRACT:

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